

ON THE BDELLOID ROTIFERA OF SOUTH AFRICA.

PART II.

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PLATES 10-14.

In a footnote * to Part I of this paper I stated that I had inadvertently made use of a generic name (*Monoceros*) in the description of a new Bdelloid genus, which was already pre-occupied and therefore inadmissible.

I propose here to change the generic name *Monoceros*, with its derivatives MONOCEROTIDAE and *Monoceros falcatus*, into *Henoceros*, HENOCEROTIDAE and *Henoceros falcatus*.

In Part I, pp. 77-82, I gave descriptions of three new species of the genus *Macrotrachela*, and shall now complete my list :

GENUS MACROTRACHELA.

***Macrotrachela verecunda* sp. nov.**

Pl. 10, figs. 1-1c.

Specific Characters.—Of small size. Trunk dark brown and deeply ridged. Rostrum long and very narrow, with double lamella. Antenna long and stout, equal to fully three-fourths of neck width, and bearing long setae. Teeth two. Foot short with narrow ankle and three stumpy toes. Spurs not very long, of a distinctive shape. Corona equal to collar in width. Sulcus very narrow. A slow creeper. Size, 1/120th inch.

This is a very small animal with a dark brown trunk and very hyaline neck and foot. The trunk has uneven coarse ridges, giving it an appearance resembling the surface of the rough bark of a tree. The skin must be viscous, as fragments of the debris

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were seen adhering to the trunk. It is rather a sluggish creeper, with a very deliberate slow pull-up of the foot. It seems to avoid the open, and to prefer to withdraw under shelter; and on account of this habit, and its small size, it is very difficult to examine.

The rostrum is very narrow, but the double lamella is quite prominent. The antenna is long and stout, and has very characteristic brushes of setae. These brushes are extremely long, and always show the same graceful curve, and so clear are they that they are easily distinguished with a 1 inch objective. There are prominences on each side of the antenna, like those seen on the spined varieties of *Macrotrachela*. The dental bulb is heart-shaped and there are two teeth.

The foot is short and the ankle very narrow. The spurs are rather short, and have their outer borders convex and the inner curves concave, producing a converging effect.

The shape and character of the antenna brushes and the spurs are very constant and distinctive.

The corona is equal in width to the prominent collar, and the sulcus is extremely narrow on the ventral side, the wheels almost approaching each other. The upper lip is glaucous, and refraction from parts below causes optical difficulties. What appears to be the upper lip consists of a triangle over an oblong. It is not easy to make sure whether the oblong belongs to the upper lip or is part of the rest of the corona. The apparent upper lip shows fully higher than the corona, broad across. When the lip is looked straight down upon—that is, when the animal is feeding in a perpendicular position—the upper edge is convex dorsally and shows three parts (Pl. 10, fig. 1c). The middle part seems to be the cross section of the triangular part lying on the oblong. The triangular part was not always well seen. The oblong may possibly be a high ridge from wheel to wheel crossing the sulcus, and shown up by the triangular part. The base of the upper lip is thick and raised like a frill.

Habitat.—Not very often seen, but possibly common enough, as I saw samples from three different places. They are easily overlooked on account of their small size and their habit of resting under the rubbish.

Found in ground or rock moss Grahamstown, also Euphorbia Kloof and Draaifontein farm, Uitenhage district.

Macrotrachela smithi sp. nov.

Pl. 10, figs. 2-2a.

Specific Characters.—Of large size and elongated. Corona wider than the collar, and sulcus equal to four-fifths of the disc. Upper lip a bold semicircular curve with a narrow abrupt notch in front. Antenna short, barely equal to one-third of neck width. Teeth two, well apart. Heavy rump and short foot. Spurs divergent with fairly wide convex interspace, distinctive. Toes three, stout. Size, 1/65th inch.

This is a large handsome animal. When fully extended, the width from the rostrum to the rump very gradually and scarcely perceptibly increases. The pre-anal segment is heavy, and is distinctly marked off from the trunk. Older specimens seem to creep rather laboriously, but the younger ones are active. In some there were large oil globules in the stomach investment extraordinarily like pellets, but it was noticed that only granular matter was voided. The trunk is freely ridged.

The rostrum is stout, and has a large prominent double lamella, with several long setae, some of which are motile. When feeding, the rostrum often lies over the upper lip, and whether so or tossed farther back its cilia were always seen to be in rapid motion. The short antenna has three little knobs at the end, and has on each side of it a swelling or protuberance. Small, roundish jaws bear two teeth, far apart. The contractile vesicle is large and of slow period. There are probably four segments in the foot, which is short, and ends in three stout toes. The second segment is extremely short, and may possibly be the spur segment. Spurs are of moderate length, about equal to three-fourths of the ankle width. They are widely divergent, broad at the base and narrowing suddenly on the inside half-way down, becoming very attenuated and ending in very sharp points. There is a convex interspace. An elegant appearance is given to the spurs by the graceful lines bounding them.

There is a seta with a bulbous base on each wheel of the handsome corona. The sulcus is wide and the collar prominent. Corona, collar and neck are to each other as 14, 10 and 9. The upper lip is semicircular with an abrupt notch in front, which just breaks the bold outline.

The egg is more oblong than oval, narrowing very little at the two ends.

This Macrotrachela has a general resemblance to a species of *Philodina* which I have seen in South Africa. The latter is similar to, if not the same as, one which Mr. Bryce has named *P. patricia*, but has not yet published a description of; he kindly sent me some specimens. The curve of the upper lip is not so bold, and the spurs though similar are not the same in detail.

Habitat.—Ground moss, Kamaehs farm, Uitenhage. The species was obtained from the one place only, but was seen on different occasions. It has not been observed again recently.

Macrotrachela timida sp. nov.

Pl. 10, figs. 3–3a.

Specific Characters.—Of large size, hyaline except the stomach investment, which is of a pale decided pink. In general appearance, more especially in the rump and spurs, it is similar to *M. plicata* (Bryce). Deeply plicate. Rostrum long and stout. Antenna equal to one-third neck width. Teeth two. Spurs divergent and decurved slightly, and equal to ankle width. Corona wider than prominent collar, with a seta on each wheel. Sulcus equal to two-thirds disc. Upper lip rises, almost square across in front. A fleshy tooth in sulcus. Size, up to 1/60th inch.

This is an exceptionally handsome animal when feeding. It has, like all having the type of rump of *M. plicata*, a most irritating, jerky manner of creeping. But this one seems wanting in pluck, and is easily stopped in travelling, by obstacles, and contracts even when meeting with slight obstruction. It does not feed readily in the open, and after a time all will have retired into hiding. Some could be discerned feeding amongst the debris, but of course details could not be made out. At last I thought of washing the rubbish off them. Waiting a day or so till they had quieted down and felt at home, I ran a drop of water under the cover-glass; this broke up the rubbish and carried it down towards the other end, and generally left *M. timida* uncovered, and feeding away gaily. They generally kept on feeding for some time very quietly and steadily, before seeking shelter again. In a few hours all would be once more hidden from view.

The rostrum is long and stout, and seems to have the quadruple lamella, but of this I could not make quite sure. There is a large brain mass. The dental bulb is winged and has two strong teeth.

The trunk is almost equal to the rest of the animal in length and shows five clear divisions of about equal length. It has the toughness and elasticity of skin of *M. musculosa*, which enables it to keep a perfectly regular shape, whether extended or contracted.

The lumbar region has what might be called the "crinoline" type. The anal segment stands out with a sort of thin almost rigid flange at bottom—one could almost imagine a wire support inside—so that whatever tightening or alteration takes place in front, the posterior maintains its wide and peculiar shape. The pre-anal segment also keeps its shape as if it were stiffened. Whether the animal is stretched or relaxed, the shape of the rump is practically constant. The lumbar region, seen sideways, looks the deepest part of the body, largely due to the lumbar plicae standing up so high. These lumbar plicae, which look like two firm smooth membranes with their lower edges deep down, rise up above the surrounding surface; the upper edges have a convex curve longitudinally. There is an abrupt dip from the anal segment to the foot. The intestine is a large oval, but the contractile vesicle is rather small.

The foot has four segments, and has no boss. Of the segments, the first is the longest and ends in a rigid rim, the second has also a rim but smaller. The spurs are divergent and decurved, and as long as the width of the ankle. There is a very short interspace, and a slight shoulder is usually apparent just below. The spurs are often clipped together.

The corona is bold, and is to the collar as 14 to almost 11. The upper lip is clear cut and of a glassy colour. It rather more than covers the sulcus, and has a clean-cut almost straight front margin. About half-way back there is a line or ridge across the lip, and between this and the front margin on the lateral borders are two curves, probably defining skin folds. There is a short fleshy tooth on the sulcus bridge which shows in certain positions only, when the head is well up.

The egg is a broad oval, almost round, and has blunted narrow prominences all over the surface, almost touching each other.

M. timida can be kept in a slide for a considerable time.

Habitat.—Ground moss, Springfield and Euphorbia Kloof, Uitenhage, also Somerset East. They were abundant in one sample of moss, but only a few were noticed in the other samples where they occurred.

Macrotrachela timida var. *inquiries*.

Pl. 10, fig. 4.

Specific Characters.—Long and rather narrow, swelling slightly towards the middle of the trunk. Rump has the crinoline arrangement permanent in all positions. Foot is fairly long and very narrow, of at least four segments and with a boss on the first. Spurs fully longer than ankle, divergent, with short interspace and a slight shoulder below. Rostrum long and narrow. Antenna short, about one-fourth neck width. Teeth two, not very large. Corona scarcely wider than the non-prominent collar, and with a seta in each wheel. Upper lip rises high, practically square in front. Size, 1/75th inch.

This is a very fast, restless, jerky creeper. The corona collar and neck are nearly equal in width. The upper lip is thick and fleshy, and rises as high as the highest part of the wheels. It springs laterally from well above the widest part of the collar, and lies almost against the secondary wreath. The front margin is fairly broad and is practically straight across when the animal is feeding in a horizontal position. Along the middle of the upper lip longitudinally, the flesh is thicker and bulges up. When the head is well below the horizontal, this elevation hides the straight front margin, and gives the appearance of a rounded margin. The pedicels are deep, and the rostrum lies far back when the corona is unfurled.

The trunk is closely ridged.

Habitat.—Ground moss, Kamaehs farm, and tree moss, Bulk River, Uitenhage.

Fairly common.

There are one or two other varieties, which differ chiefly in the nature of the foot.

These wickedly restless creepers form quite a little group—*M. plicata*, *M. plicatula*, *M. ehrenbergii*, *M. timida* and its varieties. It is quite easy to go astray among them, as one gets as a rule very little opportunity of examining all the details at a time,

they being usually shy feeders, and one may chance on another species next time when examining the field, as all are somewhat alike while creeping. Besides their similarity in habits, all have similar spurs, and the crinoline type of rump, either permanently or to a certain degree when relaxed and sitting back on the foot. *M. plicata* is the only one which has not got the unbroken front margin of the upper lip, and which is not very shy in feeding. The animal I take to be *M. ehrenbergii* has more segments than eleven, but otherwise answers fairly well to the description (1). The peculiar extensions of the rostral sheath or auricles described by Janson are evidently part of the lamella, which appears quadruple. The two inner folds were evidently taken by Janson to be the whole lamella. *M. plicatula* as I found it had the projecting broad annulus on the posterior of the first segment of the foot, and not on the second as given by Murray (6).

Macrotrachela faveolata.

Pl. 10, figs. 5-5d.

Specific Characters.—Of large size. Stomach investment deep yellow. Antenna stout. Dental bulb roundish with thick comb-like edges, bearing eight large teeth. Stout lumbar region and foot. Spurs and upper lip somewhat like those of *M. russeola*. Corona just wider than the collar. Sulcus slightly over half the width of disc. The main ridges of the trunk bear large warts or knobs, and there are small warts and dots all over the surface. Size, about 1/60th inch.

I found this fine large species several years ago, but have never met with it since. Mr. Murray also found it in some moss I sent him from the same gathering in which I discovered it. Unfortunately I have lost my notes on it, but from the sketches I still have, and the sketches Murray sent me, and a few marginal notes thereon, I am able to give sufficient data for purposes of identification.

It is in some particulars like *M. russeola*—in spurs, upper lip and general build—but it has a most extraordinary peculiarity, the possession of three kinds of processes; very large warts or knobs along the trunk ridges, from five to seven in each; and smaller sub-hemispherical warts and fine dots in extraordinary numbers all over the surface. The large warts consist of a bundle

of threads or possibly tubes, and are well seen from the side view (fig. 5c). From the front view each has an alveolar appearance (fig. 5d).

There is a curious growth in the neck.

Murray suggested the name *Callidina faveolata*, so I have retained it. I have no record of the nature of the toes, but I think it quite possible that it may have to be transferred to the genus *MNIOBIA*.

Habitat.—Rock moss, Euphorbia Kloof, Uitenhage district.

A fair number were seen in one gathering of moss. I have very often examined moss from the same place, but never had the good fortune to find the animal again.

GENUS HABROTROCHA BRYCE.

Habrotrocha placida sp. nov.

Pl. 11, figs. 6–6c.

Specific Characters.—Of moderate length, very narrow and hyaline in colour. Narrow rostrum with double lamella. Inclosed wheels characteristic. Antenna very short—about one-third neck width. Teeth about eight, very small. Spurs, short cones without interspace. Corona is equal to two-thirds of the width of collar, and the pedicels are extremely short. Upper lip is bluntly triangular with large elbow-bends directed backward. Trunk is lightly stippled. Size, 1/90th inch.

This species is of a quiet, gentle habit. When placed on the slide, it may not begin feeding for a very long time, but when it does it will remain in the same position for hours, without any swaying movements, but keeping the corona perfectly steady, or shifting the head almost imperceptibly; when it does creep it does so gently and not with jerky motions.

The distinctive features are the corona and the upper lip. The corona is to the collar as 4 : 6. Its wheels have scarcely noticeable pedicels, and the primary wreath being thus so near the secondary, the interference due to their vibrations makes it difficult to observe the upper lip. The upper lip is triangular and is raised at a slight angle to the wheels. A short distance from the front each border makes an elbow-bend backwards, and uncovers its base, which is seen as a straight line. The bends can be seen high above the collar when viewed laterally. Sometimes when the

animal is apparently anxious to feed, it may be seen hesitating and evidently dubious about the advisability of unfolding the corona. On these occasions the upper lip is pushed stealthily forward, with its elbow bends compressed backwards into sharp angles, and the ends of the collar apparently thrown forward (fig. 6c). The corona is not yet unfurled, but the rostrum is thrown back.

When creeping it appears long and narrow, and makes a short gentle glide.

The inclosed wheels are a glaucous mass with a clear-cut outline, small and round with a flattened front. The lateral plicae are well marked; and the cross dorsal marking, from which the lumbar plicae spring, is unusually far forward.

When feeding, the front trunk segment usually stands well out from the neck (fig. 6). It feeds in the open. The jaws are large, but the teeth are very small and difficult to see clearly, and are possibly more than eight in number. The lumbar region is not unlike that of *Otostephanos torquatus-amoenus*, and indeed it is difficult to distinguish between the two species when creeping. I usually look first for the long setae at right angles to the rostrum which characterise *O. torquatus-amoenus*.

Habitat.—Ground and rock moss, Kamaehs, Euphorbia Kloof and Springfield. It was fairly abundant.

Another rather smaller form and probably a variety of the above was seen. The corona was very slightly wider, and in the upper lip the front part of the elbow-bend—if bend there were—could never be certainly made out. Otherwise it had the same appearance. It was deeply stippled. The number of teeth was probably seven.

Habrotrocha plana sp. nov.

Pl. 11, fig. 7.

Specific Characters.—Short and broad with narrow extremities of a bluish-grey colour. Lamella double with several long setae under it. Antenna from one-third to one-half neck width. Jaws large, teeth two, very small. Trunk very broad and slab-like; lumbar region of distinctive shape. Foot has possibly four segments, a very narrow ankle and stout toes. Spurs short. Contractile vesicle is large. Corona less than collar. Upper lip triangular. Size, 1/100th to 1/120th inch.

This is a tremendously swift creeper, and slithers or glides fully its own length before planting its toes. It is very steady when feeding, and generally feeds in a fully extended position. Every now and again, it suddenly glides along for a step or two and recommences feeding, and may keep on repeating this performance for a long time. The suddenness with which, on these occasions, it unfolds its corona and is quietly feeding again is almost startling. The pellets are often large and numerous, but sometimes scarcely distinguishable in a glairy mass.

The trunk is very broad, and flattened dorso-ventrally; and seen sideways has a slab-like appearance. The rump is peculiar, the fleshy parts are wrinkled inwards in two waves, leaving the remainder empty and glassy looking.

The corona is to the collar as 9 : 10. It has a seta on a small pimple on each wheel. When looking down on the sulcus a cord-like rim can be seen on each side, running over the edge and on to the wheel, just showing and no more, an apparent clear space between it and the wheel.

The upper lip is triangular, its two sides just visibly curved, and does not rise far up the sulcus. It is clear and glassy, and rises gradually from the two borders and the apex, towards the middle of the front of the rostral segment, somewhat like part of a dome. The rostral segment during feeding is very rounded dorsally, it bulges up from the sides, up to and round the rostrum, which occupies the greater part and stands well up, the whole having a sort of inverted-saucer appearance.

The foot has very heavy glands which pass through the anal segment. The spurs sometimes resemble a fish tail, but are usually short cones, scarcely divergent, and without interspace.

H. pulchra (2) is the nearest to this, but differs in the upper lip and the number of teeth.

Habitat.—Ground and rock moss; common in Uitenhage district; also found in Grahamstown.

Habrotrocha iners sp. nov.

Pl. 11, figs. 8–8c.

Specific Characters.—Of moderate size with long neck; hyaline in colour. Rostrum very long and narrow; lamella single. Antenna very long, one-fourth longer than neck width. Teeth three, fairly large and uniform. Lumbar region heavy. Foot

very short, of three segments. Spurs fairly long, almost parallel. Corona one-half wider than collar. Oral entrance has a great projecting spout form. Upper lip very distinctive. Size, 1/80th inch.

This is probably a tube builder, but none was ever seen in a case. The older specimens were very sluggish and hardly ever moved from the place where they were first seen. They are far from being of the *musculosa*-type, as the trunk runs and streams into all shapes when feeding. At first I decided it was a *Mniobia*. In the first example observed the foot was planted against the cover-glass and the spur segment was seen to have a slight expansion at the end (Pl. 11, fig. 8c). There seemed to be clusters, two or three, of very fine muscular sucker-like threads from the end and no sign of toes. Later, however, a young specimen was observed creeping against the cover-glass, and showed toes very distinctly, two well spread out, and evidently a smaller one though not well distinguished. It progressed at rather a slow rate, with a rasping dead pull. The pre-intestinal part appeared fully as long as the rest of the body.

The rostrum is somewhat of the nature and appearance of that of *Rotifer longirostris*. It is as long as the width of the neck, and is very narrow and of practically uniform width. The joint in the middle is very distinct. In the older specimens when attached, the rostrum has generally an empty appearance, and the sheath is peculiarly mica-like. The skin of the neck occasionally has this wrinkled mica appearance; when young the neck is fleshy, and the rostrum lacks much of this appearance. The young was seen to bend the rostrum at right angles to the body, and to twist it about easily, as if it were fitted into a socket. The lamella is single and spoon-shaped. The inclosed wheels are elongated. The antenna is very long—one and one-fourth times the neck width—and it is very narrow from the joint to the end; and has a stout bunch of setae in the middle of the extremity.

The antennal segment is longer than usual. Behind the antenna, and not alongside, are two peg-like projections, apparently cone-shaped in one view, and triangular in another. They rise direct from the segment with no ridges or connection between them. *H. ampulla* has similar prominences. The jaws are long and rather narrow, and bear three teeth on each side, fairly large and uniform in size.

There is a large and round intestine, and the contractile vesicle is rather small and of short period. The short foot consists of three segments. Spurs are of moderate length, slightly shouldered on the outside at the roots, and then proceed downwards with a slight convex curve. They are not divergent.

The corona is a very pretty one, with strong cilia which play to a considerable extent into the great oral entrance. In some views it reminds one of some lily in bloom with its long stalk and bulb; the long rostrum and antenna standing out well, almost at right angles, contribute to the elegant outline. The corona is to the collar as 9 to 6 and is much inclined ventrally. When the neck is bent dorsally, till the plane of the wheels is horizontal, the ventral view shows the great oral entrance-spout standing straight up, and well above the level of the wheels (Pl. 11, fig. 8b). This large spout-like mouth is very similar to that of *H. angusticollis* (2).

The upper lip is a thin-looking, glassy, laminate plate, rising well up, broad and curving slightly outwards, and crowned with a flat triangle.

When the neck is bent, rings are formed simulating joints, and even in the rostrum a false joint may appear. When the animal is contracted into a ball, the head is seen attached to the front of the trunk by about a score of delicate muscular threads, parallel and stretched like piano strings.

A yellow case was seen frequently, and only where this animal was found; empty, except in one instance when there was an egg inside. I did not see it hatch out, but soon after it did I found a half-grown specimen on the slide, which I had not observed before, and which probably came from the egg. The case is almost round in shape, and has no neck. It has a hard thin wall with granules in it, and there are about a dozen rings or bars projecting on the inside, looking like lines of latitude on a globe.

Habitat.—Draaifontein farm ravine pools. Found in fair numbers, on different occasions, but only from the one place.

***Habrotrocha valida* sp. nov.**

Pl. 13, figs. 16–16a.

Specific Characters.—Of small size, short and very stoutly built. Hyaline in colour, but older ones occasionally have the stomach coating slightly brown. Rostrum short and thick;

lamella single, undented. Antenna about one-fourth neck width. Teeth large, six. Foot short, stumpy, of probably four segments. Spurs very short cones without interspace. Corona is narrower than the collar; sulcus a mere slit. Upper lip rises to the top of corona, large, with a broad straight front margin and a parallel distinct ridge well back. Size, up to 1/100th inch.

This is quite a handsome sturdy little animal. It is fleshy in appearance, and the distinction between the segments is not always easily discernible. It is a voracious little creature, and soon the dozens that may be seen in a slide settle down to feed, and very quickly the trunks assume barrel-like forms, so that when they then creep they have a trussed-fowl or penguin-like appearance. The shape when feeding is characteristic, all being alike. It is a fast traveller with a long stride, but usually it moves about very little, and remains very quiet for long periods when feeding, and is not easily disturbed. The rostrum is stout and the lamella is single and undented, transparent and almost semicircular. The dental bulb is comparatively large, and the six closely set teeth can be readily seen.

The lumbar plicae are not very prominent. There are heavy foot-glands, and the spurs are very short, non-divergent and without interspace. Each has a very broad base, and quickly narrows to a sharp point, with a straight line, or barely perceptible double curve on the inner border.

The corona is small and has very short pedicels, and the outline does not narrow in, on the lateral borders. There are two little prominences on the wheels close to the sulcus; these seem to be small loops, or swellings on cords or ridges from the wheels, running down over the inside edges just into the sulcus, which is a mere slit. The corona is to the prominent collar as 5 to 7. The upper lip rises, practically, to the top of the sulcus, with a very broad, straight front margin, and there is a band or ridge parallel to the front margin, and well back. This ridge seems to rise up from the lateral borders of the upper lip. Both ridge and front margin look bluish green while the rest of the lip is colourless.

The egg is an oval, equally rounded at both ends and smooth.

Habitat.—Ground moss, Stellenbosch. Very abundant from the one place only. Dozens were sometimes seen on a slide.

Habrotrocha alacris sp. nov.

Pl. 12, figs. 14-14a.

Specific Characters.—Very small and narrow; hyaline. Rostrum long and narrow, with double lamella. Antenna stout, about three-fourths neck width. Jaws large with two large teeth. Rump distinctly marked off from the trunk. Spurs short cones. Corona is wider than collar. Seta on pimple on each wheel. Sulcus equal to half the width of wheel. Upper lip a small rounded segment on a flat curve. Size, 1/120th inch.

This little animal creeps fairly fast, but steadily and without slithering. It assumes very graceful curves when feeding.

The dental bulb is large, and with its muscular investment takes up, practically, the whole width of the segment. The two teeth are also quite large. The trunk is very plicate. There is a distinct marking off of the anal and pre-anal segments from each other and from the trunk. The intestine is large and elongated, but the contractile vesicle is small. Spurs are equal to the ankle width, divergent and without interspace.

The corona is fully one-fourth wider than the collar, and the pedicels are very long, so that the general appearance of the corona is a little like that of *H. eremita* or *H. acornis*; only the distance between the pedicels inside does not increase upwards, and the distance from the sulcus bridge to the top of the corona is comparatively greater. There is a small round knob—not a ligule—on the sulcus bridge. The semicircular upper lip rises just up to the sulcus bridge; and the collar, above which there is a lateral expansion, shows very prominently.

Habitat.—Ground moss, Springfield, Uitenhage district. Not common and found only in moss from the one place.

Habrotrocha elusa sp. nov.

Pl. 11, figs. 9-9a.

Specific Characters.—Of moderate size, rather stoutly built but not swollen looking; keeps its shape well. Of a brownish to dark lemon-yellow colour. Rostrum stout, lamella double and prominent. Antenna short, equal to one-third neck width. Teeth six. Skin smooth and thick. Shape of rump and first segment of foot very characteristic and constant. Spurs two

short cones, with flat interspace. Stippling heavy over all trunk and foot, first segment of foot heaviest of all. Corona fully equal to collar; sulcus very narrow. Upper lip large, right to top of corona, with a small notch in front. Size, up to 1/75th inch.

This is a stout and very symmetrical animal with thick, leathery but smooth skin. It is of the *musculosa*-type as regards the quick response to the action of the muscles, so that in whatever position it is the shape for that position is practically constant. The neck is extremely stout and fleshy, and its outline is made up of three graceful curves not broken by the joints.

The corona is fairly large, but is rather difficult to measure. My measurements are, corona to collar as 9 to 9 up to 10 to 9. The average would be about 10 to 9½.

The rostrum covers a large part of its segment when tossed back. There are six teeth on each side of the dental bulb, three large and three small. The small teeth are difficult to count, but in the instances where I could count them the number was three. The trunk is fleshed right up into the ridges, and shows dense round the borders, where a considerable depth of skin is seen owing to the boundary bend. This dense leathery shell or rind-like part contrasts with the interior, and has a dark-greenish tinge, like that described in *Otostephanos regalis*. It often acts in the same peculiar way as *O. regalis* when, having stopped creeping with the intention of feeding, as shown by the working of the jaws, and as if too timid to decide, it starts a panting sort of action with a queer little shake of the head up and down, and may continue this for a long time, before it unfolds the corona. When it feeds, the head is kept very steady, and the foot is generally hidden under the rump.

The form of the rump is constant. There are three folds of the thick skin on each side bulging out between the joints, or apparent joints. The middle one looks something like the prominence shown in the figure of *H. crenata* (Murray) (2, 3). All the rump—bulges included—is heavily stippled or granulate. I have never seen any crenate appearance even on the first segment of the foot, which is the most heavily granulate part. Evidently the granules are under the skin. The foot has four segments; the first is stout and curves out very delicately till past the middle, and then curves inwards much more quickly.

The second segment is much narrower and very short, and seldom much seen. Young specimens have seldom any colour, but can be identified by the foot. There is no boss on the foot; the elegant dorsal curve of the first segment is quite unbroken, though there is a thickening under the skin, like that described in *H. torquata* (8). The spurs are short cones often stippled, very divergent, with a straight fairly wide interspace. Occasionally the under border of the spurs may be seen in a straight line with the interspace. The contractile vesicle is large, and flattened posteriorly.

The egg is large, smooth and oval in shape, equally broad at both ends.

I have known this animal for many years and have spent more time examining it than any other species. For a long time I was unable to form definite conclusions about some points, and not until it was noticed that there were two species not very unlike in several details. The second one, which turned up occasionally with *H. elusa*, is paler and more lightly stippled, but for some time I thought that the type varied and included both.

H. elusa is not sluggish, and when put on a slide creeps about a great deal, and usually takes a long time to settle down to feed. After hours, it may be, one may stop and feed for a short interval and then resume creeping. It may be the second or third day before it begins to feed steadily, and then it does so very quietly, and in a characteristic position. If there be a bit of green moss about, *H. elusa* is almost certain to take refuge on or below it, and remain there. It is then almost impossible to get it clear. I do not think I have ever noticed it take refuge under withered moss. It feeds very freely on or under the moss, but there, of course, it is not possible to observe it clearly. It is also found feeding quietly in the open. I have often taken notes of one creeping and been unable to see it feeding during the same sitting. Before the next examination the specimen had probably retreated to the moss, or could not be found feeding. Then perhaps what was taken to be but a paler example was found feeding, and a sketch made, which when compared with former sketches usually showed some difference, especially as to upper lip and spurs. I changed my opinion several times with regard to these until I distinguished between the two species. A difficulty was, that one or the other was often not to be found when

wanted for comparison. Afterwards it became quite an easy matter to distinguish between the two, creeping or feeding.

H. elusa generally feeds with its head above the horizontal, and the tip of the upper lip is not then seen projecting at the front, but lies over the narrow sulcus, which usually shows a black space owing to interference, when practically no details can be made out. When the head is exactly on a level with the body the peculiar nature of the upper lip may be seen, but as a rule it requires much patience and needs much searching before one is observed feeding at the right angle. The lip is fairly broad in front with a small notch in the middle. Laterally there is a fold, from the top corner to some distance down, turned in over but not quite down on to the rest of the upper lip, leaving a space below running into the corner.

The rump is very distinctive, with the triple folds of skin on each side. The middle one is the largest and recalls *H. crenata*, but the prominence in the latter does not seem to be a wide fold of the skin—from the description—and is stated to be clear of stippling, whereas the folds in *H. elusa* are heavily stippled like the rest of the rump.

The first segment of the foot is sufficient to distinguish *H. elusa* from other species.

I do not think I have ever seen *H. crenata*, but there is evidently a resemblance in its general outline to that of *H. elusa*. The different type of upper lip, however, is alone enough to show that the two are distinct species.

H. elusa differs in many points from the description of *H. crenata* by Murray.

The corona of the former is proportionately much wider, and the front margin of the upper lip is quite different, having a notch.

It has a decided colour, whereas *H. crenata* is colourless.

It never has a crenate appearance, and the stippling is most pronounced on the first segment of the foot, while in *H. crenata* it diminishes on the foot.

The rump has three folds of thick skin and all stippled. In *H. crenata* there is but one round prominence, which is stated to be free of stippling. *H. elusa* has no boss on the foot and its spurs have a straight interspace. The inclosed discs are large. The egg is not narrowed at the anterior end. *H. elusa* is not

sluggish. Murray does not mention *H. crenata* as having been found in South Africa. If it had been as common as *H. elusa*, I think he was certain to have seen it.

Habitat.—Ground, rock and tree moss, Uitenhage district (all over), Umtata, Somerset East and Grahamstown. Very common.

Habrotrocha elusa var. *vegeta*.

Pl. 12, fig. 10.

Specific Characters.—Active, rather small, colourless. Antenna short. Neck stout and fleshy, with same outline as *H. elusa*. Teeth three large and four small ones—possibly more. Trunk plicate; stippled, as are also the rump and foot. Rump fairly heavy, without prominences. Foot of four segments; first segment long with straight borders. Spurs short cones without interspace. Corona less than collar. Upper lip narrow, rounded in front and with a slight groove. Size, 1/90th inch.

This jaunty little animal creeps fast with a short glide. It usually does not take long to settle down to feed. It can be kept healthy for a long time in a slide, and is generally seen actively feeding. Its manner of feeding is very like that of *H. plana*. It suddenly glides a step and is feeding again with startling rapidity, and keeps on repeating this performance at short intervals; but also it may remain feeding in one position for a very long time. The head is sometimes kept very steady, but usually is drawn very slowly up and down, or round and back.

The upper lip is more difficult to observe than that of *H. elusa*, being narrower at the front, and hardly projecting over the sulcus. I only once or twice got a really good view, such as made clear the details. Nearly always the blackness due to refraction in the sulcus obscures the parts. The tip is bent downwards, and there is a cross line or ridge, a little back. From the middle of this a minute groove proceeds to the front; but it would appear as if the groove does not penetrate very deeply into the substance of the upper lip, and probably does not reach the bottom at the tip, so that at certain angles no gap is seen in front, while at others a minute gap appears.

It nearly always feeds fully extended.

I find this animal in fair numbers in Aberdeenshire.

The chief differences between it and *H. elusa* are: The glide

when creeping; the want of colour; the corona is, proportionately, decidedly narrower; rump has no prominences; foot has plain, straight outline; spurs have no interspace. It feeds with neck and foot fully extended, whereas *H. elusa* lies over the foot, and always has the neck partially retracted, so that each segment shows decidedly wider than the one in front.

Habitat.—Ground and tree moss, Umtata, and Uitenhage district.

Habrotrocha tranquilla sp. nov.

Pl. 12, figs. 11–11a.

Specific Characters.—Large and shapely; stoutly built. Rostrum stout with prominent double lamella. Antenna short, about one-third neck width. Dental bulb large, oval. Teeth seven. Trunk plicae well marked. Rump fairly heavy, narrows quickly to foot. Foot narrow and short, of four segments. Spurs sharp cones, divergent, and without interspace. Corona slightly wider than collar; sulcus narrow. Upper lip projects over the sulcus, and has small gap in front. Size, 1/60th inch.

This is a large handsome animal, and occasionally shows the merest tinge of colour. The trunk is very long, and when feeding swells out like a muscular sack; the pre-intestinal part is comparatively short, and the post-anal very short. The posterior of the trunk and the rump are eccentric, raised dorsally, so that, if the toes miss the catch, the posterior swings round, and at times, when well fed, it seems compelled to shoot out the foot sideways.

Of the seven teeth, four are large and three very small. The corona to collar is as 13 to 10. The upper lip is fairly broad at the top and has a small gap. It projects over the sulcus, but not quite so high as the outside parts of the wheels. The upper half is almost oblong, and then the border bends quickly, in two curves, to the collar. The front margin is somewhat like that of *H. elusa*, but the details are more easily made out.

I find this species in Aberdeenshire with slight variations. The corona is slightly narrower, and I counted nine teeth. There was a boss on the foot. I might, however, have overlooked this characteristic in the South African species, as I did not pay much

attention to bosses at the time I found it. Otherwise, the two agree extremely well.

Habitat.—Rock moss, Kamaehs farm, Uitenhage district.

Habrotrocha pertinax sp. nov.

Pl. 12, figs. 12–12a.

Specific Characters.—Very small, narrow at front and widening gradually to the rump; hyaline. Rostrum narrow with prominent double lamella. Antenna short, about one-third neck width. Teeth three to four, quite large for pellet makers. Rump heavy. Foot of apparently three segments. Spurs sharp cones, divergent, no interspace. Corona to collar as 4 to $7\frac{1}{2}$. Sulcus a mere slit. Upper lip a broad mass rising right up, and projecting slightly over back of wheels. Trunk clearly stippled. Size, $\frac{1}{120}$ th inch.

This is an active little animal. It keeps on for a long time creeping fast with a slither or glide, sometimes for hours without resting. It is so small that it is quite easily overlooked, and when searching particularly for it in a new slide I hardly think I ever found it, as it apparently keeps out of sight in the debris, or rolls up in a ball after being disturbed. Only after a day or two, when examining the slide, by chance one might be caught sight of in the open.

The corona is scarcely more than half the collar width. When the head is thrown back it has the appearance of *Scepanotrocha* (5), as then the edges of the wheels just show above the big upper lip. Seen horizontally, the upper lip is a broad mass right up to the top of the corona, but seems to turn slightly in at the middle. The edge of the upper lip, rising up from the collar, seems to just pass over the back of the wheels, and to form a sort of cradle for the back of the corona. When it is feeding—lying on its back—with the head bent up above the horizontal, the square, broad outline of the upper lip can be seen just above and behind the wheels, also the part mentioned above appears triangular in outline over the wheels. It usually stands straight up on its toes when feeding, and keeps in one position, or very slowly turns its head; it keeps stretching and stretching till sometimes the length is considerably greater than the creeping

length. It may keep on feeding for a long time, and different views are obtained as it turns its head, but being so small the details are not easily made out. There is no play of cilia dorsally, but a great flutter round the pedicels towards the oral entrance, and straight up above the corona.

Habitat.—Ground moss, Springfield. Only seen from one place, and, from the number actually seen, apparently fairly abundant.

Habrotrocha gulosa sp. nov.

Pl. 13, figs. 15–15b.

Specific Characters.—Of fairly large size; hyaline in colour, except that the pellets are usually bright yellow or green. Rostrum stout and long. Antenna as long as one-third neck width. Teeth three, fairly large. Anal segment long, with large contractile vesicle. Foot slender and short. Spurs short cones with fairly straight interspace. Corona as wide as collar, with narrow sulcus. Upper lip a wedge rising from a flat curve. A seta with a bulbous root on each wheel. Trunk heavily stippled. Size, 1/75th inch.

This is a gluttonous animal, and in a very short time, when feeding, becomes crammed with pellets. It is heavy towards the end of the trunk and lumbar region, and when well fed becomes very much so, and penguin-like. When it begins to creep after a heavy meal, its balance is so disturbed that on letting go with the toes the lumbar region swings round, and the toes catch on the right or left as the swing allows, and are occasionally pulled quite up by the trunk falling right over to the one side or the other. It is a laborious business on such occasions for it to progress. At times it creeps fairly fast with a glide. When feeding it sometimes starts off swimming at tremendous speed, and may keep this up for some time.

The inclosed discs show a bold clear outline. I could not make out more than three segments in the foot.

The corona bears strong cilia which vibrate swiftly, and often make quite a haze round the wheels. The under lip is of a blunt spout-like shape, and projects a fair distance. The upper lip is often hidden by the rostrum, and is quite peculiar in shape.

A narrow wedge-shaped ridge rises up from the middle, just on to the sulcus bridge. This ridge is not straight up and down, but bends in with a sharp curve, at the top, over the sulcus bridge. The sharp edge of the wedge is dorsal, and curves round over the top, so that looking down dorsally, with the animal horizontal, a sectional view of the top of the wedge is got, looking like a very short stout ligule, apparently on the sulcus. It was thought at first to be a ligular process. Seen from the side the wedge shows broader (fig. 15).

The egg is ovoid, both ends broad and equal.

Habitat.—Ground moss, Uitenhage commonage (Mosel Road) and Springfield. Fairly common.

Otostephanos gen. nov.

Type.—*Otostephanos auriculatus* (Murray) = *Habrotrocha auriculata*.

Generic Characters.—BDELLOIDA having a ring of fair thickness round the corona with short breaks dorsally and ventrally.

Whether the ring is real or false, the appearance is so distinctive that there is no difficulty whatever in identifying a species as belonging to the group, after one is once known. It is easy enough, with the 1 inch objective, to distinguish whether a corona is ringed or not, even if it be one whose diameter is only 1/900th of an inch.

Bryce (8) is of the opinion that the ring is a ghost one. Murray (7) thought it real; to me it seems real enough. I cannot satisfy myself that the explanation that the ring is due to interference is sufficient, as for one thing there are many coronae which have no rings, whose disposition of the primary and secondary wreaths appears in nowise different from that of those which have. Also, as Murray states, there is no trace of motion in the ring, and the outline can be very clearly defined.

There is difficulty also in accepting the ring as real. From the lateral ear or loop appearance the ring seems to stand clear of the corona, but the ring possibly has a connection through a transparent membrane, the ring itself only being visible on account of its thickness. The ring seems close to and connected with the corona alongside the sulcus and also at the dorsal break.

Otostephanos regalis sp. nov.

Pl. 14, figs. 19–19b.

Specific Characters.—Large; of a lemon colour generally. Rostrum stout and long. Antenna fully equal to half neck width. Dental bulb long and narrow, with six teeth. Heavy rump and short stout foot of four segments. Spurs short cones. Trunk deeply plicate, and stippled. Corona about one-fourth wider than the collar; sulcus narrow and shallow. A seta on each wheel. Upper lip a semicircle set on a base with a ligule on the top. A steady feeder. Size, 1/65th inch.

This is a large, powerful animal. It is a swift creeper, and a bold feeder in the open; and is very symmetrical, with a distinctive shape both creeping and feeding. It is of the *musculosa*-type and recovers its bold curves and lines almost instantly, not sagging anywhere, as the leathery skin is thick and elastic. Focusing down to the middle-depth of the trunk, the outline, owing to the depth of skin under view all round the margin, stands out with a dark-greenish shade on account of its density, and shows like the rind in a sliced citron fruit. The circular muscles are very distinct.

The colour varies, usually lemon all over—deepest in the ovary—but sometimes of a pinkish yellow. The trunk, rump and foot including the spurs are heavily stippled, the first segment of the foot more especially so.

Corona to collar is as 12 to $9\frac{1}{2}$. On each wheel is a short seta with a bulbous base on what looks like a raised cone, but is evidently a triangular ridge across the wheel. The setae are inclined towards each other. There is a rosette round the closed mouth.

The ring in *O. auriculatus*, Murray (7), is stated to have a break or gap laterally. There is an apparent gap in the ring of *O. regalis*, but not a real one. The lower part projecting from near the collar (dorsal view) does not belong to the ring, but is the secondary wreath or rather the base supporting it; and if it were continued through the apparent gap, would form a continuous curve with the upper part, and thus accentuate the idea of a break. The lower part (secondary wreath) is not a broken line, but bends back almost on itself, or at most at a sharp angle, and

then across to the oral entrance. The upper part of the ring comes down to near the bend of the secondary wreath and continues close, past and above it. When a slightly more ventral view is had, the two can be seen alongside each other for a short distance, but the continuation of each curve in its own direction gradually separates them.

The ventral view (fig. 19b) shows the real relative positions of the lines well. The ring rises from the hollow below the shallow sulcus, and can be followed round to the apparent gap, as can also the base on which the secondary wreath is situated. The two seem to approach each other towards the gap.

When the head is hanging down, well below the horizontal, the three planes—top of corona, ring and secondary wreath—can be seen projecting, one behind the other.

The upper lip is like no other I know. It shows like a clear transparent semicircle, with a metallic sheen, set on or rising from a flat curve from the collar. A stout peg-like ligule rises from the top and is always present. The rostrum has its segments marked very clearly, and the double lamella is very transparent and sometimes not very well seen, though quite large. There are several long setae and one or two thicker ones with bulbous roots. When tossed back the rostrum stands up perpendicular to the segment as a great mass and covers nearly all the segment; the cilia are generally in motion.

The dental bulb is long and narrow, and carries three larger teeth and three, possibly four, very small ones. The first joint in the neck posterior to the oral entrance is scalloped or serrated roundly, ventrally; and the anterior of the second trunk segment has a similar appearance.

The pellets are occasionally seen fairly large, but generally quite small, and at times can hardly be distinguished in a thick glairy mass. The foot is very short; the first segment is heavily granulate, the second is scarcely noticeable, so short is it. The spurs are slightly divergent short cones, but in one or two large examples the inner borders showed a slight double curve. There are heavy glands right up through the foot.

When settled and about to feed, it has a very peculiar quick, panting sort of action, with a queer little throw-up of the head, the jaws working all the time. It may keep this up for some seconds before unfurling the corona.

Habitat.—Rock and ground moss, Kamaehs, Springfield and Euphorbia Kloof in Uitenhage district. Fairly common.

Habrotrocha torquata Bryce I have never seen, but from the description take it to be one of the ringed group, and so it falls under the designation *Otostephanos torquatus*.

There is a ringed one, very common in South Africa, similar to the above but differing in the upper lip. I shall describe it as a variety.

***Otostephanos torquatus* (Bryce) var. *amoenus*.**

Pl. 14, figs. 20–20a.

Specific Characters.—Of moderate to small size; spindle-shaped; trunk slightly grey, or bluish, transparent. Rostrum long and fairly stout, has a very long seta on each side at right angles. Antenna equals one-half neck width. Teeth very small, seven, possibly more. Trunk plicate and finely stippled. Fairly heavy rump, and short foot of four segments. Spurs, short cones. Corona is equal to the collar; sulcus very narrow and shallow. Upper lip has three blunt points on it. A seta on each disc. Size, 1/85th inch.

This animal generally creeps about a great deal at first, when put in the slide, but eventually settles down to feed very quietly. It is not a very fast creeper, and occasionally seems to have to rasp its foot from the glass with a steady pull. The rostrum has several setae under the lamella, and there is one on each side at right angles to the rostrum, fully longer than the width of the rostrum. Though pliable, they were not distinctly seen to be motile. I think these setae cannot be borne by *O. torquatus*, as Bryce was hardly likely to have overlooked them if present. The neck is stretched out when feeding, and generally with the head bent up.

The dental bulb is small, and the teeth are so small that they are seldom distinguishable at all with a 1/6th inch objective, when the animal is feeding. The rump is fairly heavy and distinctive, and the first segment of the foot is also distinctive, the sides being curved. The spurs have no interspace.

After some experience, it is not very difficult to identify the creeping form. *H. placida* has a general resemblance, and is often found feeding with it, but one has only to look for the

long setae at right angles to the rostrum, which if present indicate the variety *amoenus*.

The upper lip almost curves down for some distance from the collar, then turns quickly upwards with a graceful curve to the fairly broad front, which, when the head is on a level with the body, shows three minute knobs. When the head is raised somewhat, a rounded part is seen in front, and also the triple part above and behind it. The upper lip does not lie flat on the corona, but stands up at a considerable angle, so that the rounded part mentioned above may be the under side of the lip raised up and backwards so as to come into view; or, as I have sometimes thought, there may be two parallel membranes, the front one plain and the back one with the triple top.

The setae on the middle of the wheels turn outwards, while in *O. regalis* they turn inwards.

The inclosed wheels have a clear-cut border, forming a single oval, with practically no trace of the usual double appearance.

Habitat.—Rock and tree moss, Uitenhage district and Stellenbosch. Abundant.

Otostephanos monteti sp. nov.

Pl. 14, figs. 21–21a.

Specific Characters.—Of small size, short, plump and fleshy; of glaucous colour, with at times a very slight yellowish tinge. Rostrum short and broad, with prominent double lamella. Antenna very long. Dental bulb elongated, with eight small teeth. Foot of four segments. Spurs, cones of moderate length. Corona equal to collar, shallow, with prominent ring. Sulcus a mere slit ventrally. Upper lip, rectangular with a ligule-like extension on upper border. Size, 1/100th inch.

The two species last described are moss dwellers, but this one inhabits pools. It is a rather slow creeper and has a laborious movement of the foot, but plants it well forward; it seems to have a difficulty in attaching it to the glass. This animal is most irritating when feeding. As soon as the wheels are out, it begins whirling round and round on a vertical axis, at great speed, and continues this for many minutes at a time, then suddenly with a furious dart it swims clear away. Only once

did I see a specimen feeding quietly with toes affixed, and that not for very long. On several occasions I was hopeful of getting another view, but hardly had feeding commenced when the gyrations were once more started, before anything could be clearly seen.

It is of a sturdy build. The neck is very stout and fleshy, showing no lacunae; and the throat is wide and long. The inclosed wheels are a large clear mass, nearly circular in shape, with a small break in a clear definite outline. The closed mouth shows a well-marked rosette.

This is the only ringed form yet observed which has a very long antenna. It was not noticed for some time that the antenna was long, as seldom or never does it seem to have it at full stretch when creeping. When attached to the cover-glass and about to feed, and moving the head forward preparatory to unfurling the corona, the antenna is pushed straight in front, and when at full stretch is well ahead of the rostrum; and when the wheels are out it is seen projecting for a considerable distance in front of the wheels and straight over the sulcus. It has been seen extended to fully one and one-fourth times the width of the neck. When the animal is whirling round and round, the antenna is held outwards, with the end curving backwards, and gives a fleeting glimpse, reminiscent of a pump handle, as it swings round. Of the two segments of the antenna, the front one is not much shorter than the basal one, and the front end with its brushes of stubbly setae is very trident-looking. There is a large brain mass. The jaws are long and somewhat oval, and bear eight small uniform teeth.

The foot is stout and proportionately long, and consists of four segments. The spurs are less than ankle width, scarcely divergent and without interspace.

The corona is equal to the collar in width, and rather shallow. The collar is high up but does not protrude, and there is no narrowing-in of the neck from the collar backwards.

The upper lip is a low rectangle with rounded shoulders; and in the middle in front, extending up as a prolongation, is a long spike with a broad base, which gradually attenuates to a sharp point near the top of the corona.

This animal is easily distinguished from *O. torquatus* var. *amoenus* by its long antenna, stouter build and its habits when feeding.

I believe this is the same animal as the one described by Mlle. Montet (9) as a variety of *H. torquata*, but left unnamed.

Habitat.—Draaifontein ravine pools. Abundant.

GENUS PLEURETRA Bryce.

Pleuretra reticulata sp. nov.

Pl. 13, figs. 18–18a.

Specific Characters.—Of small size, widest near the middle and tapering to both extremities. No spines on anterior border of trunk. Dorsally, four transverse rows of spines on trunk, also one pre-anal and one anal. One row ventrally near front of trunk and two spines farther back. Rostrum has very long setae, especially two laterally projecting ones. Antenna stout, about three-fourths of neck-width, with long setae. Teeth two. Foot of four segments, narrow, with boss on first segment. Spurs distinctive. Transverse ventral ridges nine or ten. Corona to collar (minus flaps) 10 to 12; sulcus narrow with sharp peg-like ligule. Upper lip rounded with a notch. Stippled. Size, 1/120th inch.

After examining this species carefully in 1914, and on looking over some older notes, I found a set which I had completely forgotten on this very animal. Thus I was furnished with a good opportunity for comparison, all the more fortunate in that the spined species are notoriously variable. Evidently this is a very stable form, as the sketches are practically identical. It resembles *Macrotrachela aculeata* in shape, and differs from the other spined species in not having the clumsy rump. Its shape is elegant in all positions, and the spurs, which are always seen when it feeds, finish off the appearance well. It is beautifully stippled over trunk, foot and spurs.

At times it creeps quite fast with a glide, and moves more quickly than the other spined species.

The anterior border of the trunk has no spines. The trunk has four dorsal cross rows, with eight spines each in the first, second and fourth rows, and nine in the third. There are four spines on the pre-anal segment and four on the anal. Just above the last two rows of spines there is, in each case, in the middle of the segment, a double blunt short thorn. The ventral row consists

of six spines plus two large lateral ones, and is situated on the first segment of the trunk and about the middle of it. The other two ventral spines are near the sides and opposite the first dorsal row. In one set of notes it is stated that the two front rows are incipient, just as if the bends of the ridges had grown out to points. The other rows are similar but more developed.

The rostrum is long with a fairly prominent double lamella. The setae are long, and noticeable when feeding; two from the corners are long, and like those of the variety *amoenus* (p. 173). The brushes of setae in the antenna are about as long as the antenna itself. There are two plates alongside the antenna. The dental bulb is rounded with a quadrate upper margin, and the two teeth are not far from the middle. The transverse ventral ridges have a wavy appearance, more especially the first. The spurs are longer than the width of the ankle, divergent and decurved, almost sickle-shaped.

Each wheel in the corona bears a seta, and these two setae cross each other in every case. The ligule is always present and is a very short peg-like structure. The upper lip rises just over the sulcus bridge, and is broadly triangular with a rounded front margin, slightly notched. There are two ear-like flaps from the lower lip, quite abnormal in size.

The longitudinal ridges are wavy and help to give a reticulated appearance to the animal. The skin is not hardened nor suggestive of a lorica. Apparently there are only three toes. The opening of the sheath from which the toes protrude is round and very small. When resting against the cover-glass, only three toes can be seen and they appear to fill up the whole opening. The back one may bifurcate, but I could not trace any sign, as the toes when planted on the glass are unfortunately always in the shadow of the trunk, and being so small cannot be well seen. I never could get a proper side view of them.

The egg is broadly ovate and symmetrical, with sixteen or seventeen small swellings, giving it a wavy outline. The spines and ridges are visible in the egg, before the hatching takes place.

I found one specimen in Aberdeenshire which agreed extremely well in all particulars with the South African ones. It gave the same suggestion of three toes.

Habitat.—Ground moss, Draaifontein and Springfield, Uitenhage. Fairly abundant.

GENUS SCEPANOTROCHA Bryce.

Scepanotrocha galeata sp. nov.

Pl. 13, figs. 17-17b.

Specific Characters.—Of very small size ; very slender. Creeps fast with a glide. Narrow rostrum, with single spoon-shaped lamella. Antenna stout, very short, about one-third of the very narrow neck. Dental bulb small, rounded, with four or five teeth. Trunk deeply plicate ; lumbar region long. Foot moderately long, apparently of four joints. Spurs of moderate length, divergent, without interspace. Upper lip a heavy mass, broadest at upper margin. Size, 1/130th inch.

This is another very small species, only likely to be noticed when in a favourable position. The most noticeable feature is the overgrown helmet-like upper lip, which is broadest at the upper margin, the front being straight or a very flat curve. Round and towards the front the upper lip is thick.

The wheels could never be clearly made out. The wheel-whirl is all in front and in a vertical direction. Only a very indistinct or hazy view of the wheels can be got through the flare of the cilia, but they seemed to be very small, possibly about two-thirds of the collar. Only from one view did I get the impression that the wheels were in the usual position. The indications on the whole were in favour of the wheels being at a very considerable angle to the usual position.

Sometimes there was an appearance as if there were a thin laminate part between the upper lip and the wheels. It is a dapper little fellow, and feeds usually with the neck bent gracefully, and holding the head well up in a gallant way. When creeping, the neck shows three gentle curves on each side.

Habitat.—Rock moss, Euphorbia Kloof, Uitenhage. Rare.

GENUS MNIOBIA Bryce.

Mniobia animosa sp. nov.

Pl. 12, fig. 13.

Specific Characters.—Of moderate size ; spindle-shaped. Rostrum fairly stout. Antenna broad, very short, about one-fourth neck-width, with a prominence on each side of it. Front of dental segment wide. Dental bulb small, with three large well-

separated teeth. Lumbar region fairly heavy. Contractile vesicle fairly large. Spurs short. Foot short, of five segments. Corona equal to collar. Upper lip a triangle. Deeply stippled. Size, 1/80th inch.

This is a rather keen-looking, graceful animal when feeding, and generally feeds with the foot extended. It is deeply stippled from and including the dental segment down to the spurs. The front of the dental segment is wider than the part in front of it. The anal segment looks double. The foot is smooth, and short, though it has so many segments. Spurs are not very sharp, but are decurved so that they look usually very short and very blunt, like those of *Mniobia obtusicornis*. There is a swelling, longitudinally, along the first foot segment, which is short. The corona is to the collar as 8 to 8. The sulcus is equal to about one-third of the disc width. The upper lip is flat, rising abruptly near the middle into a triangle whose base is as wide as the sulcus.

Habitat.—Ground moss, Grahamstown.

GENUS ADINETA Hudson.

Adineta cuneata sp. nov.

Pl. 14, figs. 22–22a.

Specific Characters.—Of large size, stout, hyaline. No setae or expansions on the rostrum. Antenna fairly long. Teeth two. Rump has no distinctive shape. Contractile vesicle large and elongated. Foot stout, of five segments. Deep constriction at ankle when foot is fully extended. Spurs short and at right angles to foot, with a large convex interspace. Toes stubby. There are large foot glands. Size, 1/75th inch.

Murray (7) was well acquainted with this animal and considered it a good species. It has a short hopping sort of motion, reminding one of the hop of a rabbit, when it is feeding and moving about slowly.

The only species near this is *A. vaga*. *A. cuneata* has a less elegant shape, and a slightly squarer head. It has a stouter foot and a segment more in it, and a narrower constriction at the ankle when extended, which gives a distinctive appearance to the spur segment. The part posterior to the spurs is shorter and the toes more stumpy in appearance.

The two are easily distinguished from each other, at a glance, by the shape of the spur-segment and the spurs.

Habitat.—Moss; very abundant all over Uitenhage district, and in other parts.

Macrotrachela quadricornifera* var. nov. *rigida

Pl. 14, figs. 23–23c.

Specific Characters.—Very large and strong; trunk black-brown in colour; skin extremely thick. Rostrum stout and fairly long, with double lamella. Antenna long and stout, equal to two-thirds neck width. Jaws very large; teeth two large and two small. Neck very stout. Trunk deeply plicate laterally. Rump very distinctive. Foot long and narrow. Spurs excised below. Corona bold and large; sulcus wide; a short seta on each wheel. Upper lip complicated. Deeply and beautifully stippled. Size up to 1/40th inch.

This is the animal mentioned in Part I (10) as possibly a variety of *Philodina childi*, and is very likely the same as the *Callidina quadricornifera* of very large size seen by Murray (4) in moss from India.

Since I wrote Part I, I have seen a few good specimens, found in moss sent me by Mr. P. Smith, Umtata. In all these I made a careful examination as to the nature of the back toe. The animal frequently crawls against the cover-glass, but it takes such long strides that one has usually to move the stage in order to see the toes planted; and as the foot is sometimes thrown to the side, and sometimes directly under, it is almost hopeless to try to anticipate where the toes will appear. The back toe has a double appearance, something like two blunt cones, sliced longitudinally almost to the middle and placed against each other. There was an appearance of muscles up each half, but there might have been up the middle also though not seen. I thought there might prove to be an incipient toe orifice at the end of each half, but was unable to detect any signs of it. The toe appearance varies in different specimens, but fig. 23c gives a fair average. When the toes are almost withdrawn, the orifice shows more like *Philodina* than *Macrotrachela*.

It is a quiet, slow animal, deliberate in all its motions, and can be kept in a slide for a long time. The chances are that

when the slide is examined at any time, it will be found either feeding freely, or completely contracted into a ball—less seldom will it be found creeping. It sometimes lies for so long a time contracted that one has difficulty in deciding whether it is alive or not. I once put one aside as dead, and on again examining the slide in which it was, for some other purpose, found it feeding briskly.

Its shape varies very little on account of the extremely thick skin. There is never a wrinkle in the trunk, only, when it sits back feeding, the trunk widens out, but the shape is perfect. It has a habit when feeding of pushing forward the first trunk segment towards the antenna, till it stands out like a frill.

The rump is the most distinctive part. It is not particularly heavy, and rises up—fairly flat across—for a considerable distance backwards, then dips sharply down forming an elbow ridge, which is practically rigid owing to the stiffened material bounding it. I have never seen the ridge obliterated, even when the foot is fully extended. Fig. 23*b* gives a side view.

The corona is large and graceful, and the wide sulcus equal to three-fourths of the wheel-width. Corona, collar and neck are to each other as 37, 22 and 18. There is a comb-like ridge which runs across the wheel, and extends well into the sulcus with a bold curve. The central part of the upper lip front margin (fig. 23*a*) is copied from the few samples lately seen, and is rounded; but in all the large number of specimens examined formerly, the central part is distinctly triangular with a sharp apex. The Grahamstown examples were rather smaller in size than the Umtata ones.

The dental bulb is extremely large—about 1/500th inch—and is surrounded by a heavy muscular mass. Two teeth are very broad, and two, one on each side of these, are smaller, about one-fourth the size of the others, but occasionally one of these is wanting or scarcely noticeable. There is a large granular gland behind the bulb.

The intestine is large and heart-shaped, and very thick walled. There is a distinct, narrow, button-like muscular cincture between the intestine and the stomach (fig. 23).

The spurs, on the first segment of the foot, are blunt and flat, and lie near each other.

The stippling is of the same nature as that of *Philodina grandis*

(10). The stipples are larger, but are arranged in the same manner, and have the same beautiful honeycomb appearance.

Habitat.—Tree and rock moss, Grahamstown and Umtata. Fairly numerous.

A good many other species of Bdelloida were examined sufficiently to see that they were different from any that have been hitherto described, but owing to some detail or other being absent from my notes I have not attempted to describe them. There was one dainty, pert little Macrotrachela, with a very distinctive antenna equal in length to three times the neck width, motile, and with a rhythmic beat in unison with the motion of the jaws; found on weeds in running water.

I intended giving a list of all the Bdelloida I observed in South Africa, but find it impossible to do so at present. This list may appear as an Appendix to the above on some future occasion.

BIBLIOGRAPHY.

1. JANSON, O.: Versuch einer Uebersicht über die Rotatorien-Familie der Philodinaeen. Bremen, 1893.
2. MURRAY, J.: On a New Family and Twelve New Species of Rotifera of the Order Bdelloida, etc., *Trans. Roy. Soc. Edin.*, vol. xli. 1905.
3. MURRAY, J.: The Rotifera of the Scottish Lochs, *Trans. Roy. Soc. Edin.*, vol. xlv. 1906.
4. MURRAY, J.: Some Rotifera of the Sikkim Himalaya, *Journ. Roy. Micr. Soc.* 1906.
5. BRYCE, D.: On a New Classification of the Bdelloid Rotifera, *Journ. Quekett Micr. Club*, Ser. 2, vol. xi. 1910.
6. MURRAY, J.: Bdelloid Rotifera of South Africa, *Ann. Transvaal Mus.*, Pretoria, vol. iii. 1911.
7. MURRAY, J.: Some African Rotifers, *Journ. Roy. Micr. Soc.* 1911.
8. BRYCE, D.: On Five New Species of Bdelloid Rotifera, *Journ. Quekett Micr. Club*, vol. xii. 1913.
9. MONTET, G.: Contribution à l'étude des Rotateurs du bassin du Léman, *Revue Suisse de Zoologie*, vol. xxiii, No. 7. 1915.
10. MILNE, W.: On the Bdelloid Rotifera of South Africa, Part I., *Journ. Quekett Micr. Club*, Ser. 2, vol. xiii. 1916.

DESCRIPTION OF PLATES.

PLATE 10.

- Fig. 1. *Macrotrachela verecunda*, dorsal, creeping.
 ,, 1a. *Macrotrachela verecunda*, corona.
 ,, 1b. *Macrotrachela verecunda*, antenna.
 ,, 1c. *Macrotrachela verecunda*, top of corona with view of
 upper lip.
 ,, 2. *Macrotrachela smithi*, dorsal, creeping.
 ,, 2a. *Macrotrachela smithi*, corona.
 ,, 3. *Macrotrachela timida*, dorsal, creeping.
 ,, 3a. *Macrotrachela timida*, corona.
 ,, 4. *Macrotrachela timida*, var. *inquies*, foot and rump.
 ,, 5. *Macrotrachela faveolata*, dorsal, feeding.
 ,, 5a. *Macrotrachela faveolata*, jaw.
 ,, 5b. *Macrotrachela faveolata*, spurs.
 ,, 5c. *Macrotrachela faveolata*, side view, large wart.
 ,, 5d. *Macrotrachela faveolata*, front view, large wart.

PLATE 11.

- Fig. 6. *Habrotrocha placida*, dorsal, feeding.
 ,, 6a. *Habrotrocha placida*, dorsal, creeping.
 ,, 6b. *Habrotrocha placida*, top of corona with upper lip.
 ,, 6c. *Habrotrocha placida*, corona, beginning to unfold.
 ,, 7. *Habrotrocha plana*, dorsal, feeding.
 ,, 8. *Habrotrocha iners*, dorsal, feeding.
 ,, 8a. *Habrotrocha iners*, dorsal, creeping.
 ,, 8b. *Habrotrocha iners*, corona, ventral, showing large spout-
 like lower lip.
 ,, 8c. *Habrotrocha iners*, spurs and toe segment as seen in
 adult against cover-glass.
 ,, 9. *Habrotrocha elusa*, dorsal, creeping.
 ,, 9a. *Habrotrocha elusa*, dorsal, feeding.

PLATE 12.

- Fig. 10. *Habrotrocha elusa*, var. *vegeta*, dorsal, feeding.
 ,, 11. *Habrotrocha tranquilla*, dorsal, feeding.
 ,, 11a. *Habrotrocha tranquilla*, dorsal, creeping.
 ,, 12. *Habrotrocha pertinax*, dorsal, creeping.
 ,, 12a. *Habrotrocha pertinax*, corona, dorsal.

- Fig. 13. *Mniobia animosa*, dorsal, feeding.
 ,, 14. *Habrotrocha alacris*, dorsal, creeping.
 ,, 14a. *Habrotrocha alacris*, corona.

PLATE 13.

- Fig. 15. *Habrotrocha gulosa*, dorsal, feeding.
 ,, 15a. *Habrotrocha gulosa*, dorsal, creeping.
 ,, 15b. *Habrotrocha gulosa*, side view, upper lip.
 ,, 16. *Habrotrocha valida*, dorsal, feeding.
 ,, 16a. *Habrotrocha valida*, dorsal, creeping.
 ,, 17. *Scepanotrocha galeata*, dorsal, creeping.
 ,, 17a. *Scepanotrocha galeata*, corona, dorsal.
 ,, 17b. *Scepanotrocha galeata*, corona, ventral.
 ,, 18. *Pleuretra reticulata*, dorsal, creeping.
 ,, 18a. *Pleuretra reticulata*, corona, dorsal.

PLATE 14.

- Fig. 19. *Otostephanos regalis*, dorsal, creeping.
 ,, 19a. *Otostephanos regalis*, dorsal, feeding; stippling rather exaggerated.
 ,, 19b. *Otostephanos regalis*, corona, ventral.
 ,, 20. *Otostephanos torquatus* (Bryce) var. *amoenus*, dorsal, creeping.
 ,, 20a. *Otostephanos torquatus* (Bryce) var. *amoenus*, corona, dorsal.
 ,, 21. *Otostephanos monteti*, dorsal, creeping.
 ,, 21a. *Otostephanos monteti*, corona, dorsal.
 ,, 22. *Adineta cuneata*, head, dorsal.
 ,, 22a. *Adineta cuneata*, foot, posterior with spurs.
 ,, 23. *Macrotrachela quadricornifera*, var. *rigida*, dorsal, creeping.
 ,, 23a. *Macrotrachela quadricornifera*, var. *rigida*, upper lip.
 ,, 23b. *Macrotrachela quadricornifera*, var. *rigida*, rump, side view.
 ,, 23c. *Macrotrachela quadricornifera*, var. *rigida*, back toe.

Where proportional numbers are given in the text, each unit represents 1/6000th inch.